

Introducing the GDC IGCSE Y10 Mathematics 0607

Shrink

Stretch

Asymptote

Vertical shift

Horizontal shift

(x,y)

Co-ordinates

Midpoint

Cartesian Planes

Parallel

Perpendicular

Gradient

m

Math file
Fifth divider
should be named
Introducing GDC
and all notes and
worksheets from
this section
placed behind
this divider



Introducing
the GDC

notes

GDC - notes,
worksheets and
exercises
completed in class
behind first divider

Bring your file, extra paper, stationery and calculator to all
classes – there will be file checks!

Core & Extended:

- Use of a graphic display calculator to solve equations, including those which may be unfamiliar
- Notation, Domain and range, Mapping diagrams
- Understanding of the concept of asymptotes and graphical identification of simple examples parallel to the axes
- Use of a graphic display calculator to: **sketch the graph of a function, produce a table of values, find zeros, local maxima or minima, find the intersection of the graphs of functions**
- **Description and identification, using the language of transformations, of the changes to the graph of $y = f(x)$ when $y = f(x) + k$, $y = f(x + k)$**
- Recognition of the following function types from the shape of their graphs: **linear, quadratic**, cubic, reciprocal, exponential, absolute value, trigonometric.
- Identification of asymptotes from the equation of simple examples parallel to the axes
- Simplify expressions such as $f(g(x))$ where $g(x)$ is a linear expression

Starter

Given the equation;

- Find the value for y when $x = 0, 1, 2, 3, 4, 5$. Fill out your answers in the table provided.

x	0	1	2	3	4	5
y	1	4	7	10	13	16

For every

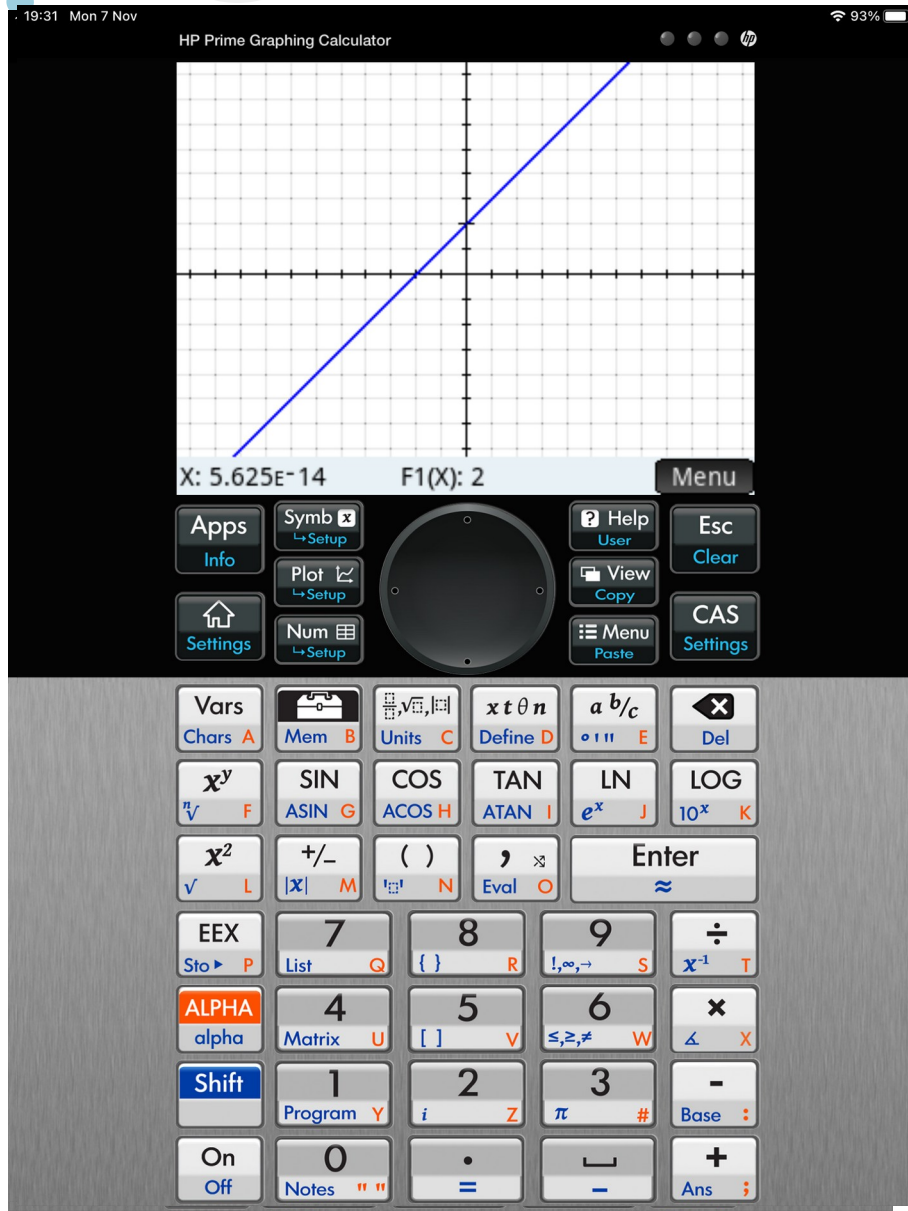
What do you notice
about the y values?

Increasing by
same amount
each time (3)

When $x = 0$, $y =$
1

one
increase in
 x , we got a
3 increase
in y

Investigating equation of a straight line



Fill in

Yay!

Plot









How to draw a
graph on your
GDC










On your GDC, plot the following straight line graphs and answer the questions on the worksheet.

The equation is for a straight line is

What do you notice about the graphs if m stays the same, and c changes? What is c ?

Function Symbolic View			18:02
✓		F1(X)=	X-5
✓		F2(X)=	X-4
✓		F3(X)=	X-3
✓		F4(X)=	X-2
✓		F5(X)=	X
✓		F6(X)=	X+2
✓		F7(X)=	X+3
✓		F8(X)=	X+4
✓		F9(X)=	X+5

On your GDC, plot the following straight line graphs and answer the questions on the worksheet.

Function Symbolic View			17:34
✓		F1(X)=X	
✓		F2(X)= 2*X	
✓		F3(X)= 4*X	
✓		F4(X)= -2*X	
✓		F5(X)= -4*X	
✓		F6(X)= -0.5*X	
✓		F7(X)= 0.5*X	

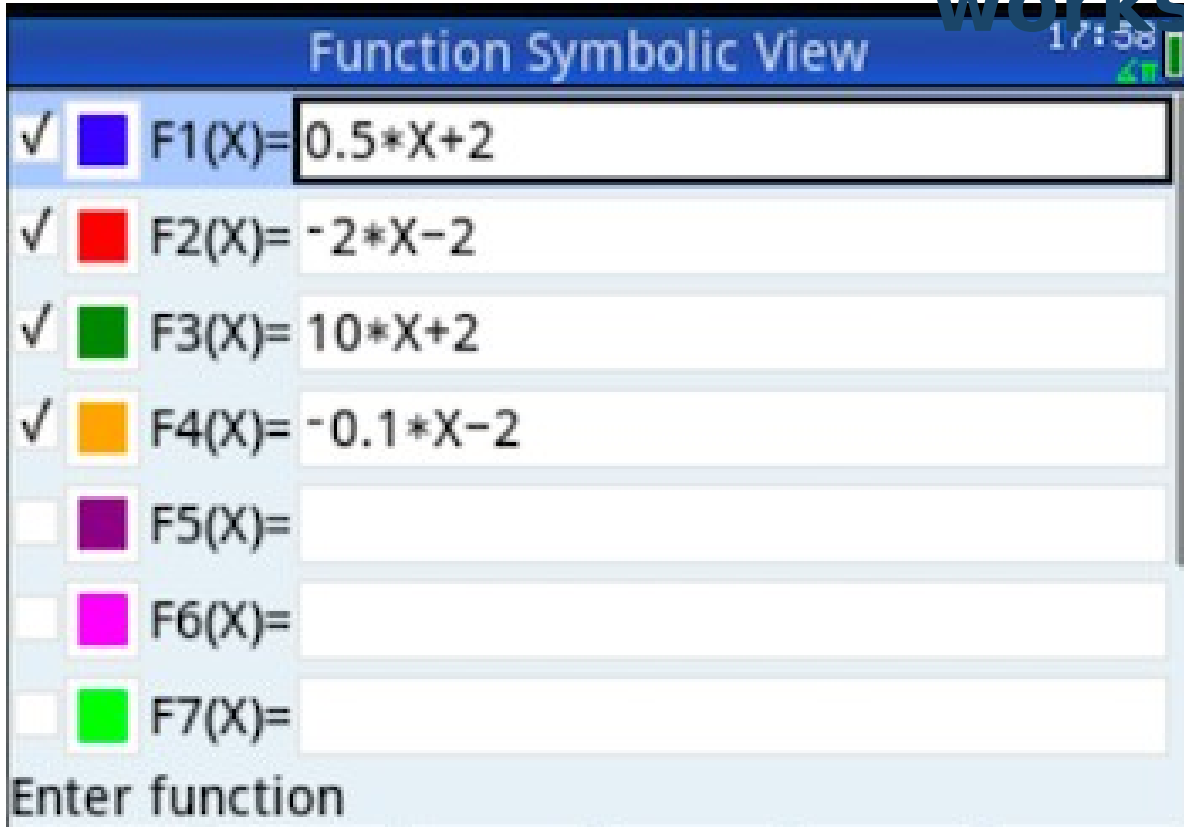
The equation is for a straight line is

What do you notice about the graphs if c stays the same, and m changes? What happens when m is positive compared to negative?

On your GDC, plot the following straight line graphs and answer the questions on the

worksheet. The equation is for a straight line is

What do you notice about the first pair of graphs and the second pair of graphs?



Function Symbolic View 17:58

✓	<input checked="" type="checkbox"/>	F1(X)=	0.5*X+2
✓	<input checked="" type="checkbox"/>	F2(X)=	-2*X-2
✓	<input checked="" type="checkbox"/>	F3(X)=	10*X+2
✓	<input checked="" type="checkbox"/>	F4(X)=	-0.1*X-2
	<input type="checkbox"/>	F5(X)=	
	<input type="checkbox"/>	F6(X)=	
	<input type="checkbox"/>	F7(X)=	

Enter function

The equation for a straight line is

What do you notice about the graphs if m stays the same, and c changes? What is c ?

What do you notice about the graphs if c stays the same, and m changes? What happens when m is positive compared to negative?

What do you notice about the first pair of graphs and the second pair of graphs?

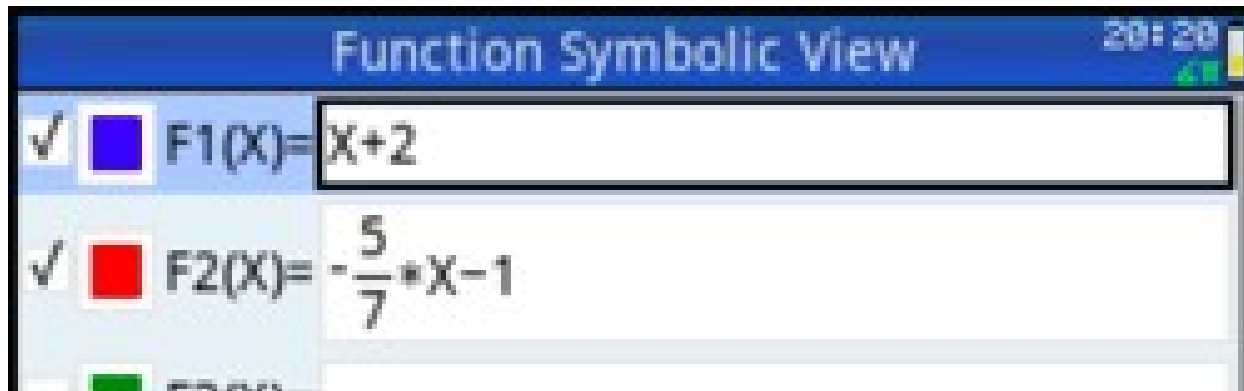
Graphs are parallel. C is the y -intercept (where it cuts the y -axis)

Positive - increasing, negative decreasing. As the value of m increases, graph gets more steep

First pair are perpendicular to each other. Second two are perpendicular to each other

Starter

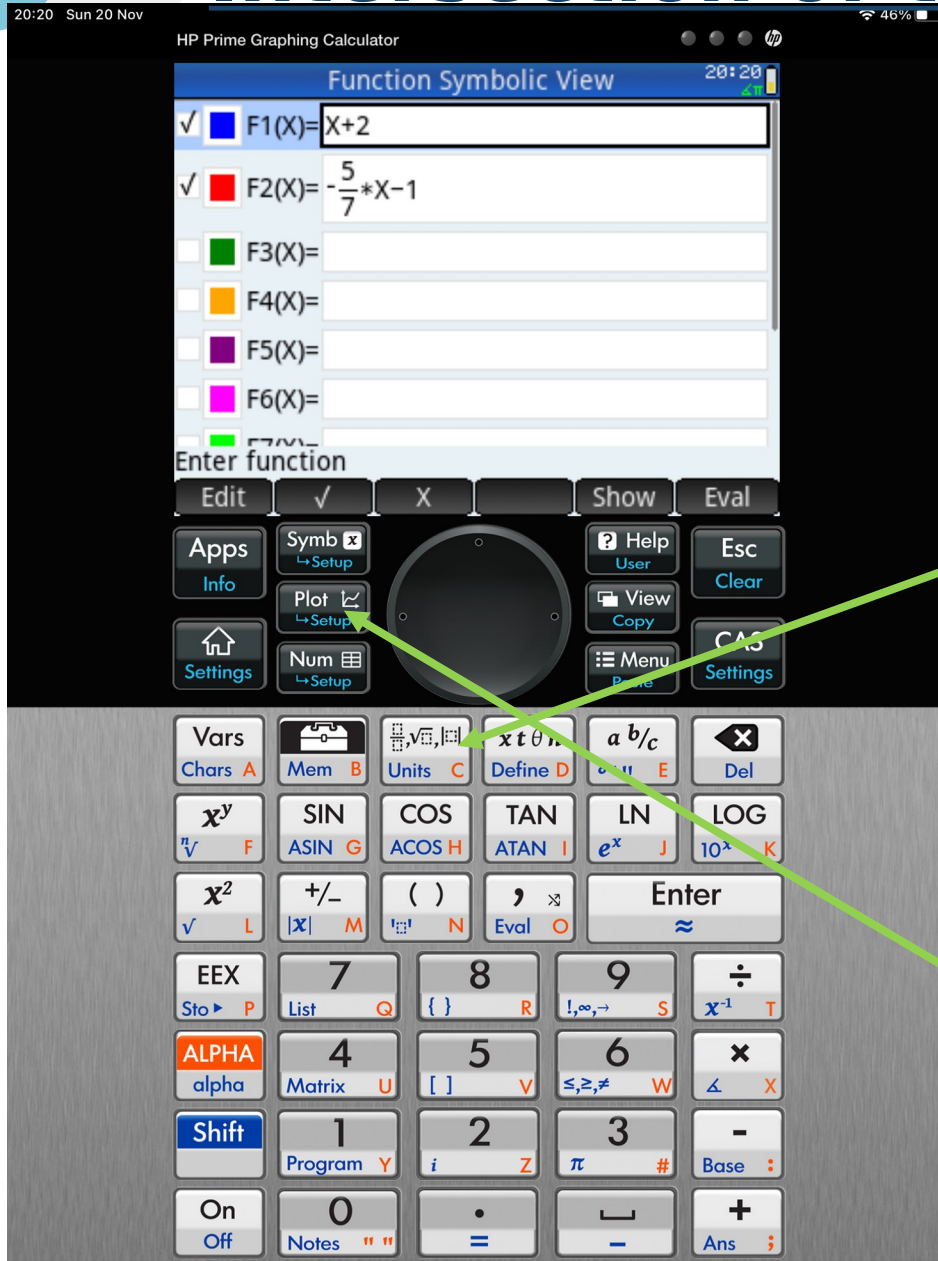
- Plot the two straight lines on your GDC given below and find the co-ordinate that they intersect



$(-1.75, 0.25)$

Instructions
to follow on
next slide,
but give it a
go!

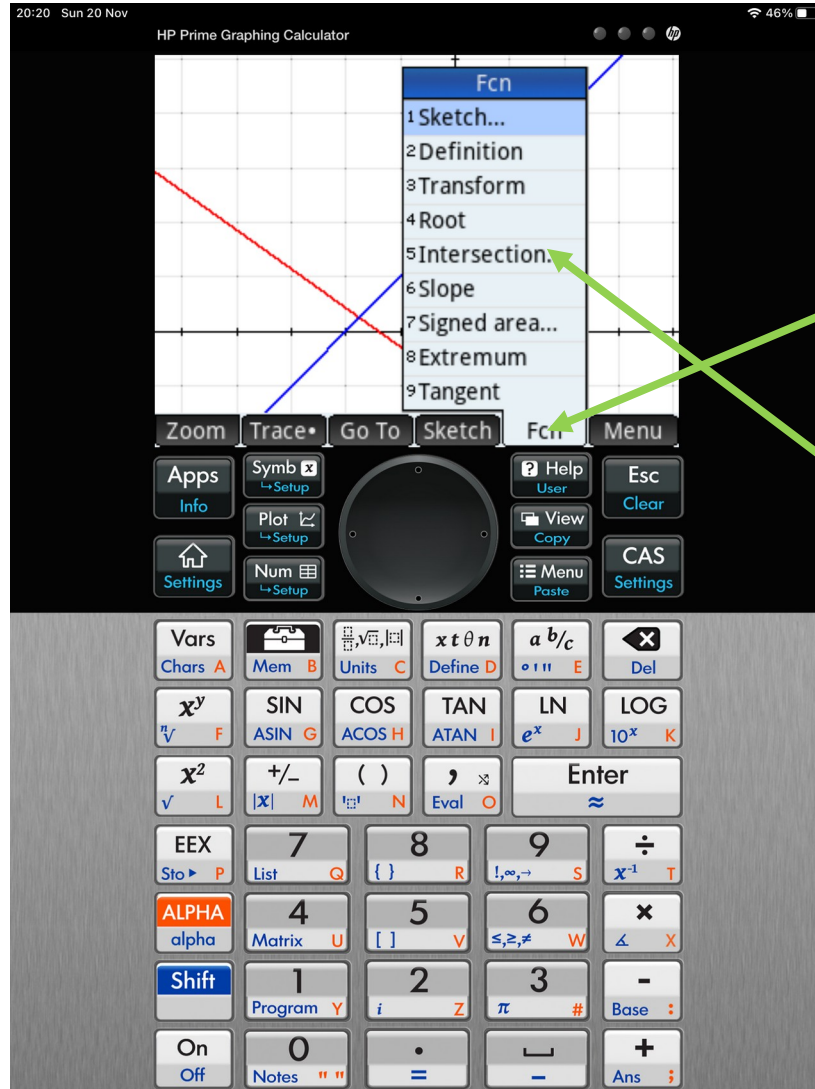
Intersection of two straight lines



Use the
Units
button for
fraction
sign

Press plot

Intersection of two straight lines

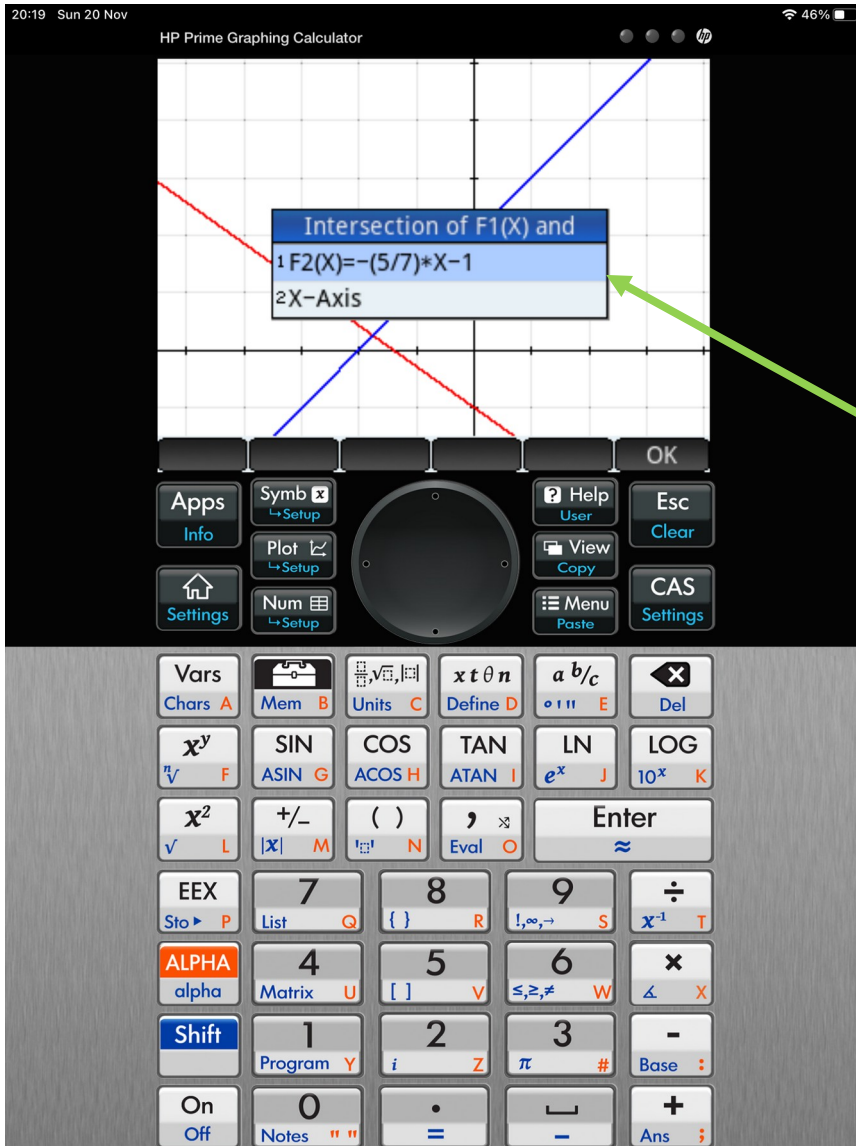


Press Fcn

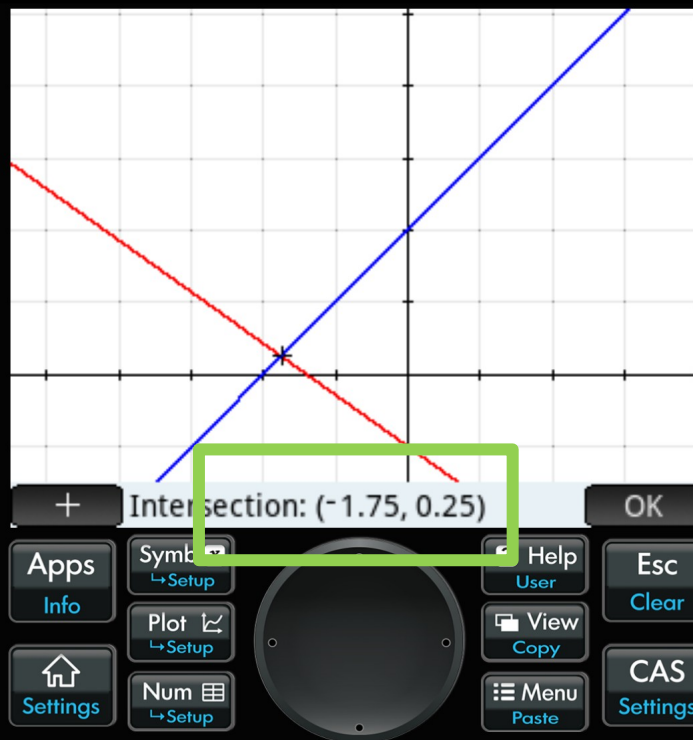
Press
Intersection



Intersection of two straight lines



Choose first one
(it is interception
between the two
graphs



This is the
intersection



Investigating using your GD

In today's investigation, use the language of transformation as much as possible!

- Language of transformations

- Vertical translation –
did it move up or down, by how many spaces?
Up by 3,
Vertical translation of +3!

Reflection over x axis
– *if mirror line is the x axis*

Horizontal translation –
did it move left or right, by how many spaces?
Down by 3,
Horizontal translation of -3!

Reflection over y axis
– *if mirror line is the y axis*

Vertical compression or stretch?
Shrink – same x value giving a lower y value,
stretch – same x value giving a higher y value

We are only looking at quadratics today and multiplying the whole graph by a number...

Student activity

- Complete the assignment on our Classroom called 'Investigating quadratics – learning to use the GDC'

Be ready to share your findings with the class!



Things we found, what did you notice?

Function Symbolic View 11:33

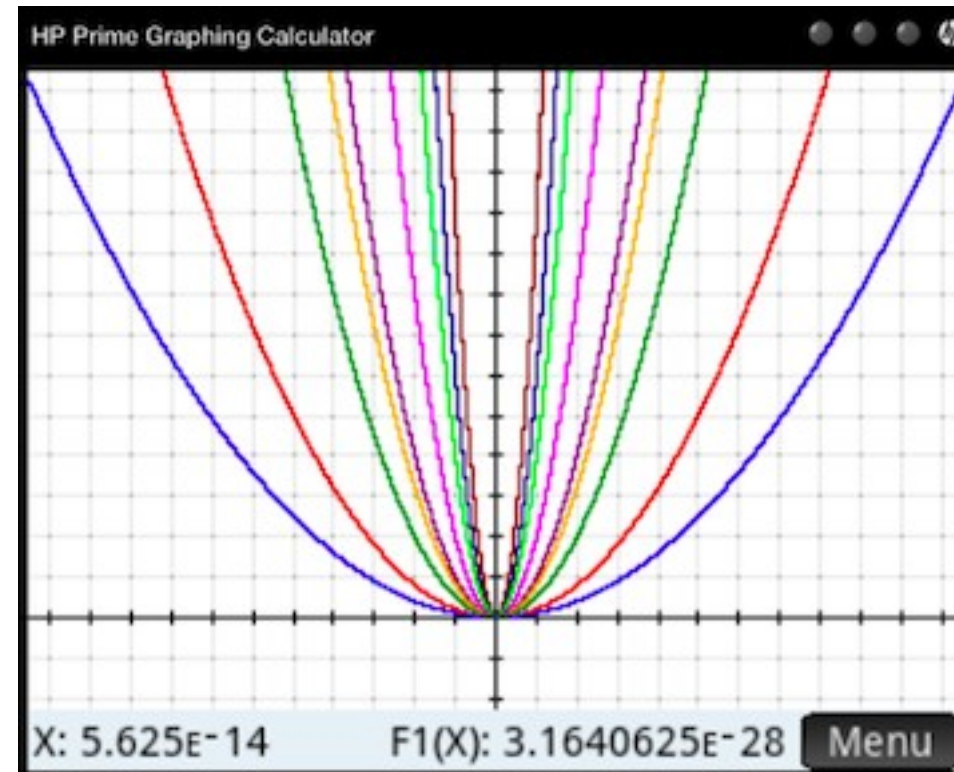
- ✓ $F1(X) = 0.1 \cdot X^2$
- ✓ $F2(X) = 0.2 \cdot X^2$
- ✓ $F3(X) = 0.5 \cdot X^2$
- ✓ $F4(X) = 0.8 \cdot X^2$

Function Symbolic View 11:33

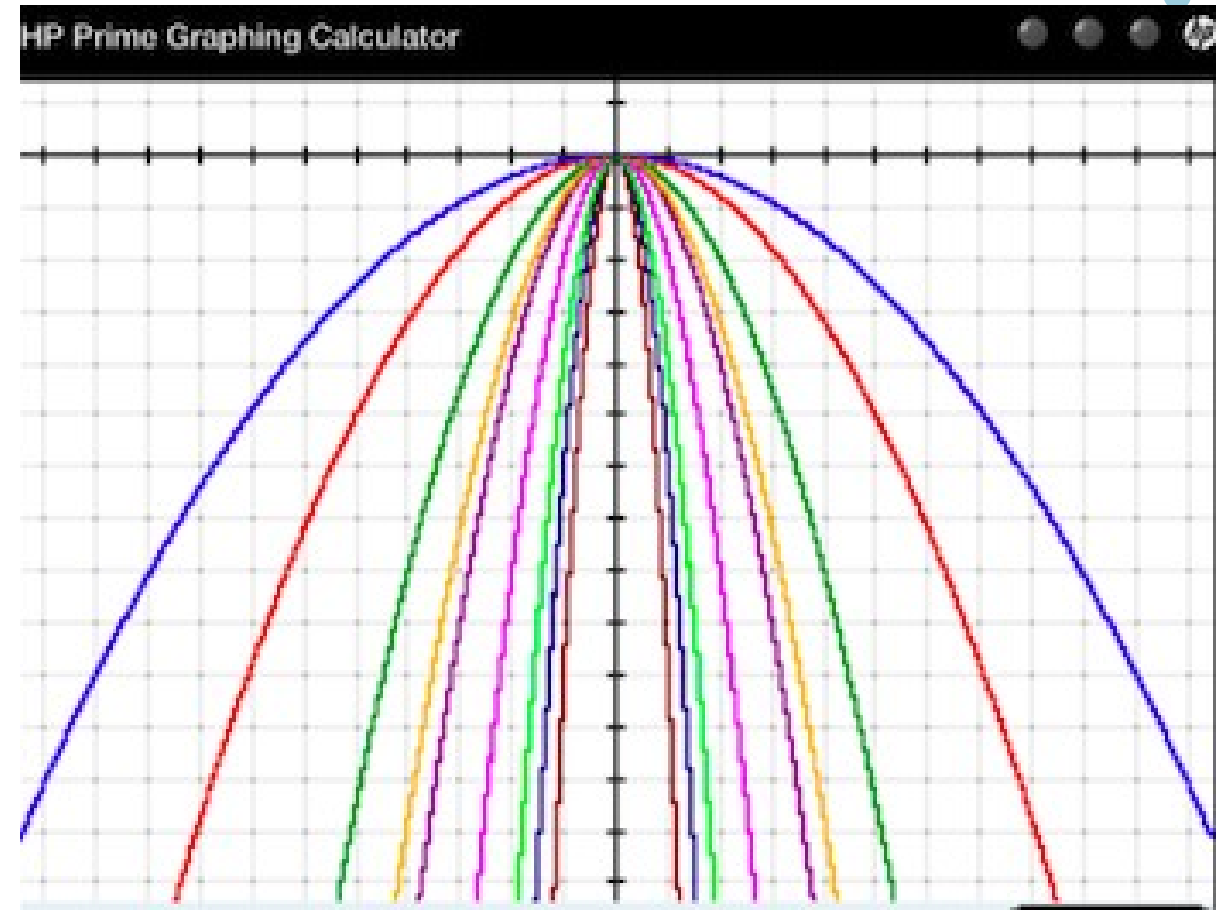
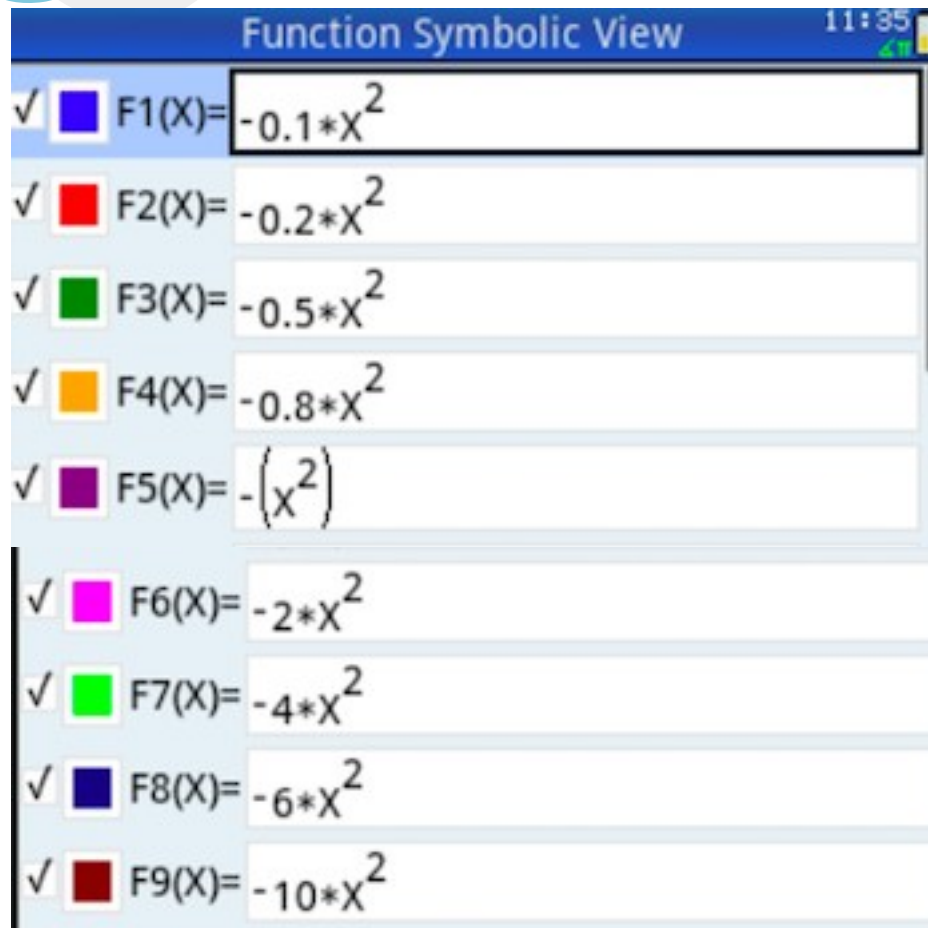
- ✓ $F5(X) = X^2$
- ✓ $F6(X) = 2 \cdot X^2$
- ✓ $F7(X) = 4 \cdot X^2$
- ✓ $F8(X) = 6 \cdot X^2$
- ✓ $F9(X) = 10 \cdot X^2$
- ✓ $F0(X) =$

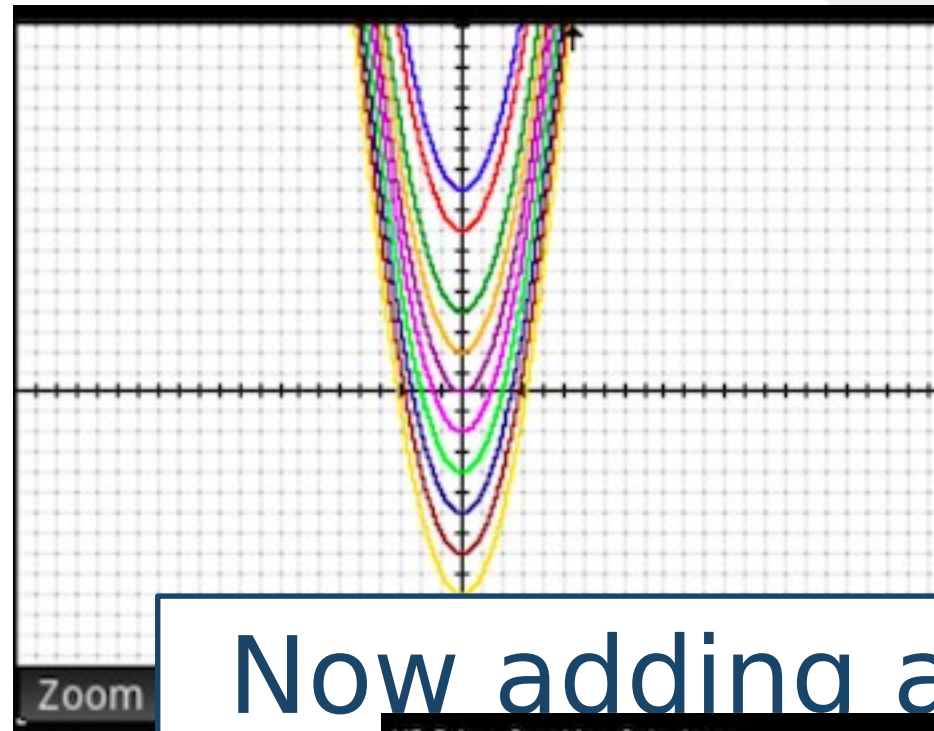
Enter function

Edit ✓ X Show Eval

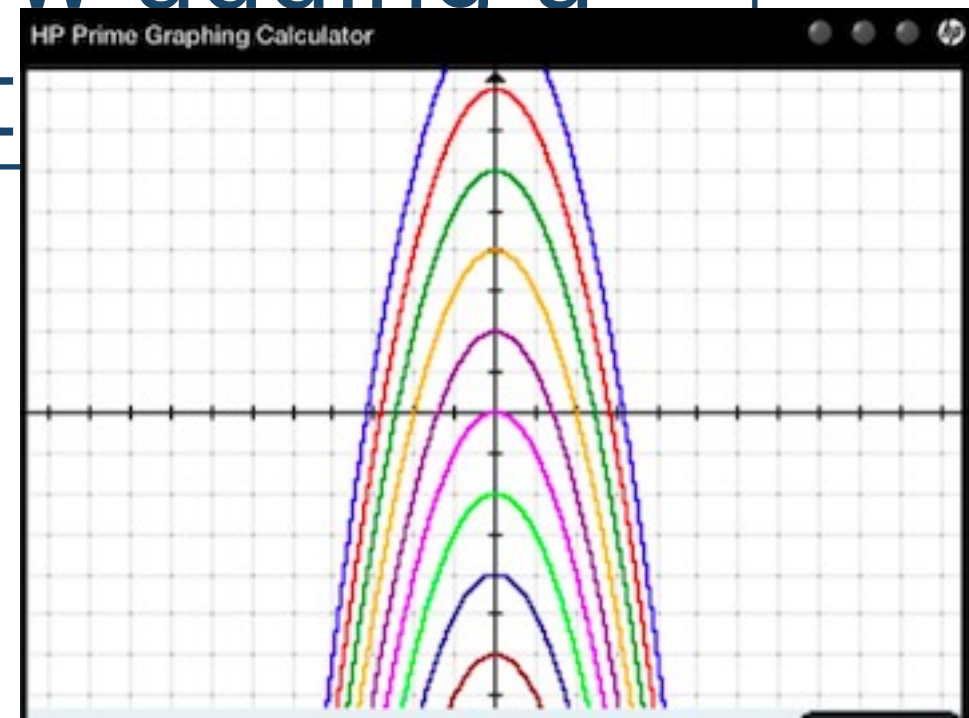


Things we found, what did you notice?





Now adding a -
t



Function Symbolic View

04:49

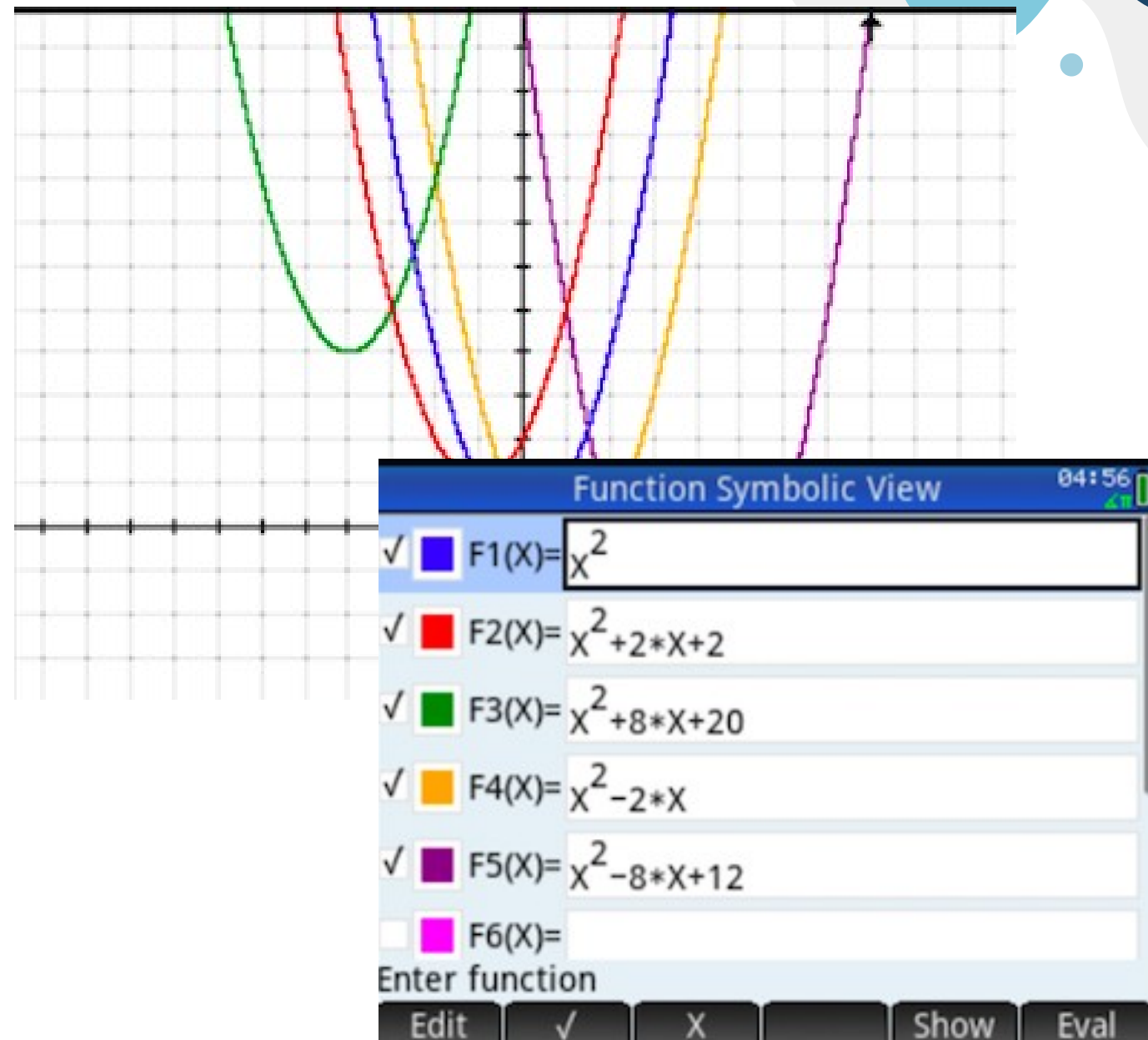
✓ ■ F1(X)= x^2

✓ ■ F2(X)= $(x+1)^2+1$

✓ ■ F3(X)= $(x+4)^2+4$

✓ ■ F4(X)= $(x-1)^2-1$

✓ ■ F5(X)= $(x-4)^2-4$



• The challenge –
the piecewise
set of functions!



This is a function... all the graphs you drew today are functions! A circle, would not be a function... hmmm.... What is the difference! Figure it out! What is a function and what is not?

Mexico versus Argentina a History

- Ignoring a few variables, the path followed by a football after being kicked or thrown, can be modelled as a parabola (quadratic)

Starter

If the general equation for quadratic is , what do you definitely know about a in the case of a ~~kick/throw?~~

It has to be negative (sad)

The impossible kick

When the graph cross the x axis, the y value is....?

When the graph cross the y axis, the x value is....?

Today, you will
use your GDC to
figure out who
will win the
upcoming match
this weekend

There is no air
resistance so no
cool Magnus
effect kicks

Something
to note
about this
game

Ms. Smout does

The Y12
Business class
chose the
match

the
technicalities

they only
kick from
the
middle
line
joining



Football pitch on a Cartesian plane

Argentina scores between $(0, 0)$ and $(0, 2.44)$.

- Mexico's scores between $(105, 0)$ and $(105, 2.44)$.

You will complete an investigation to make certain decisions about how this game will proceed.

But first an example....

• The Argentinian goalkeeper kicks the ball, and the ball follows the function

Plot on your GDC

Looks odd, press *View*, then *3. Autoscale*. Still odd? *View*, then *5. Integer*. Use fingers to zoom in and out

What was the maximum height reached by the ball to nearest whole metre?

Press *Fcn*, then *extremum*.

161
m

How far from the goalkeeper along the field was the ball when it reached its maximum height?

The x co-ordinate for the minimum point is 65 m

The goalkeeper is standing at 105 m

Therefore, 40 m

At what co-ordinate did the ball hit the ground?
Assuming no interference.

Press *Fcn*, then root

There are two roots (x-intercepts), click close to the other one and repeat Fcn, root for other one

25 m from a goal!

- Mexico kicks the ball back to try score with the equation

How far does it land from the goal posts?

35 m from the goal posts

• Mexico kicks the ball again towards to attempt a goal with the equation

Check to see if he makes it to the goal line by seeing at what point it hits the ground & substitute 105 m (goal post mark) into graph to see if it passes low enough!

Does he score a goal?

Lands at 106.5 m. The x value at 105 m (the goal post, gives 5.5 m, therefore... it does not go in

MEXICO 0 –
ARGENTINA 0

The Argentinian
goalkeeper kicks the ball
with equation

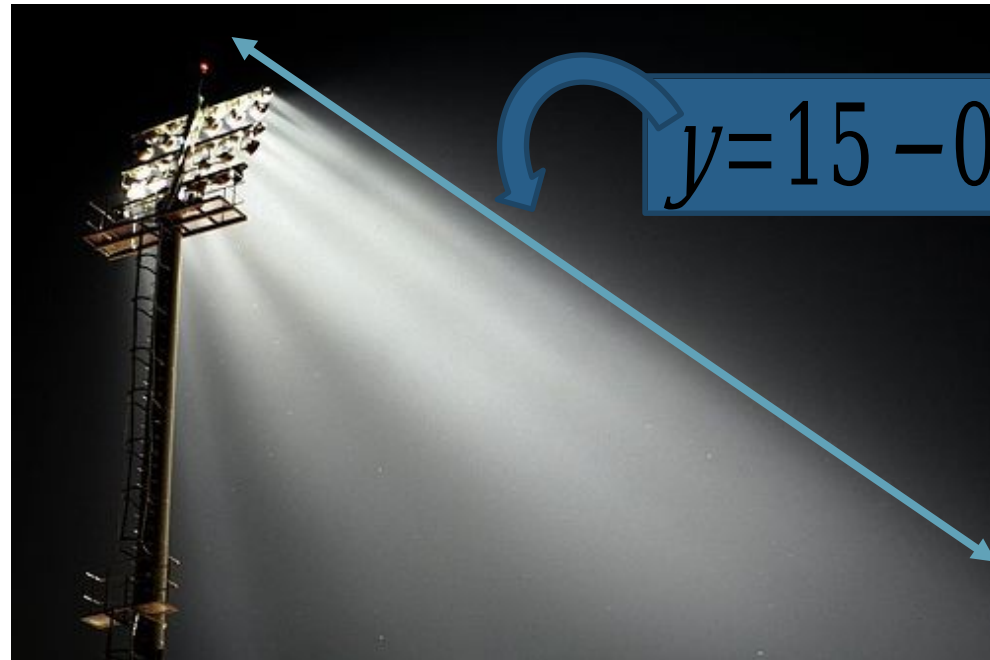
How far does
it land from
the other
goal?

7 m

On top of where Argentina scores is a floodlight which illuminates the goal and some of the field...

At what height did the ball enter the light?

The equation of the light is

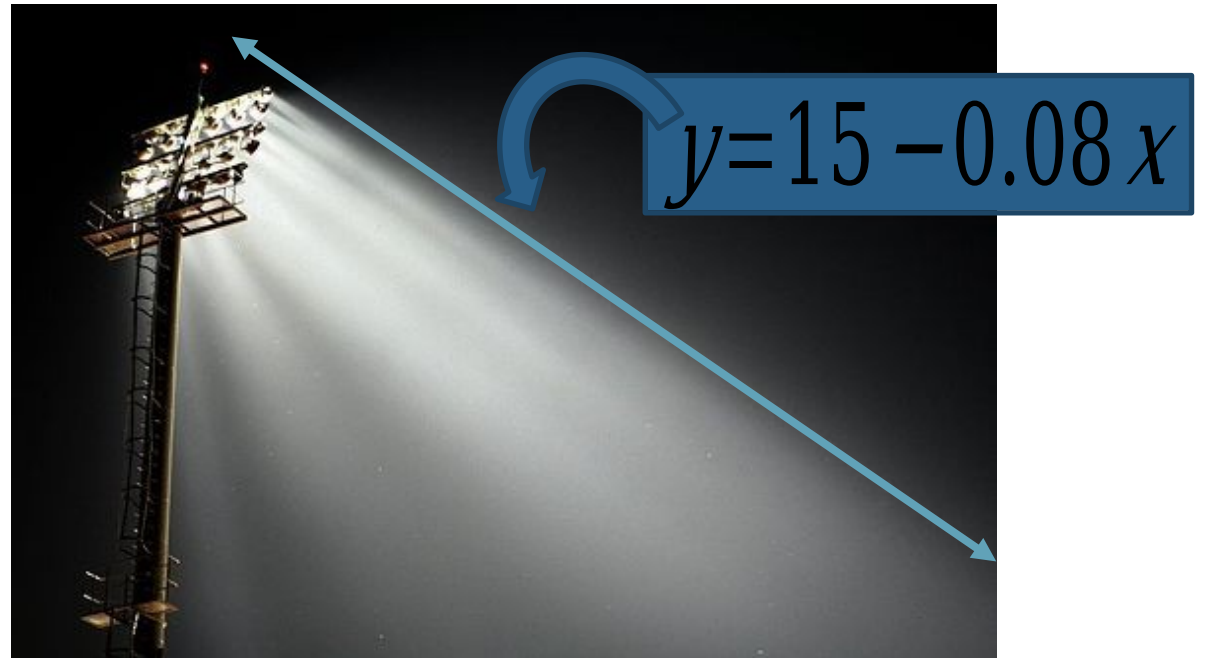


$$y = 15 - 0.08x$$

- Hint – Plot the straight line with the Argentini-ans most recent kick

Press *Fcn* and intersection

The ball enters the light at a height of 14 m



85 minutes later.... It has been back and forth the whole time, the score has not changed...

Mexico takes one final shot at a goal with the equation

Where did
Mexico kick
from?

50 m from where
Argentina scores

- What was the
maximum height of
the kick?

141 m

Definitely
not

Did they score?

Use the arrows to
move along to see
at around $x = 105$,
what y would be.

And it ends.....

MEXICO 0 –
ARGENTINA 0

7



Pusheen.Tumblr

